DIESEL RETROFIT PROGRAM

Proposed

Solid Waste Collection Vehicle Rule

Sept. 2001

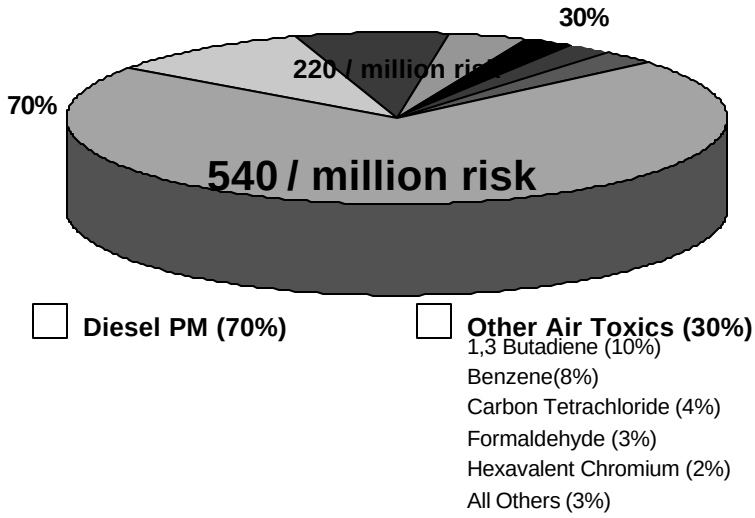
California Environmental Protection Agency

Air Resources Board

Workshop Topics

- Workshop 1 (June 2001)
- Workshop 2 (September 2001)
  - Revised proposed regulation
  - Verification of emission control systems (ECS)
  - Cost effectiveness

70% Air Toxic Risk from Diesels



Diesel Risk Reduction Plan (DRRP)

- Reduce Emissions from New Engines
- Ensure In-use Emission Performance
- Provide Low Sulfur Fuel (<15ppm) to Enable Aftertreatment Technology
- ***Require Retrofit of Existing Engines***

Mobile Diesel PM Retrofit Rules

- Public Transit Bus Fleets (Feb. 2000)
- Solid Waste Collection Vehicles (Dec. 2001)
- Fuel Tanker Trucks (2002)
- Remaining On- and Off-road Heavy-duty Diesel Fleets (2003+)

Proposed Rule Draft - Scope

- Definition of “Refuse Removal Vehicle” Changed to “Solid Waste Collection Vehicle”
  - HDDV greater than 14,000 lbs. GVWR
  - Used to collect residential and commercial waste
  - Front, side and rear manual and automatic loaders
  - Rolloffs
  - Fixed route generally

Proposed Rule Draft - Standards

- In-Use Engine Performance Standards:
  - Diesel PM certified to 0.01 g/bhp-hr
- Engines that Already Meet Standard:
  - Diesel PM certified to 0.01 g/bhp-hr
  - Alternative-fueled
- If Engine Doesn't Meet Standard:
  - Retrofit using highest verified level ECS
  - Repower
  - Convert to alternative-fueled

Alternative Fueled Definition

- Alternative-fueled Defined
  - ***Natural gas***
  - Propane
  - Ethanol
  - Methanol
  - Electricity
  - Fuel cells
  - Non-diesel fuel advanced technologies
  - These fuels used in combination with each other or in combination with other non-diesel fuels.

Dual Fuel = Alternative Fueled?

- Dual Fuel or Hybrid-electric Vehicles 0.01 g/bhp-hr diesel PM Emissions = Alt. Fueled Exempt
  - No solid waste collection vehicles meet explicitly
- Other Dual Fuel Collection Vehicles (>0.01 g/bhp-hr PM Emissions)
  - LNG dual fuel vehicles with Executive Orders
  - San Diego refuse hauler study
  - Implementation delay to Tier 3
  - Further study

Proposed Rule Draft - Retrofit

- Retrofit using an ECS
  - Verified to the highest level diesel PM emission reduction capability
    - Level 1 = between 30 and 60%
    - Level 2 = between 60 and 85%
    - Level 3 = greater than 85%, or 0.01 g/bhp-hr absolute

Retrofit - Current Status

- ECS have been Verified that Meet Level 3 85% PM Emission Reduction Goal
  - Johnson Matthey: DDC S50 Bus (1999-2000), S50 Truck (1999), and S60 12.7L (1998)
  - Engelhard: Cummins M11 (1995-1997); ISM (1998-2001)
- Applications
  - Trucks (refuse, fuel tanker, long haul)
  - Buses (urban and long haul)

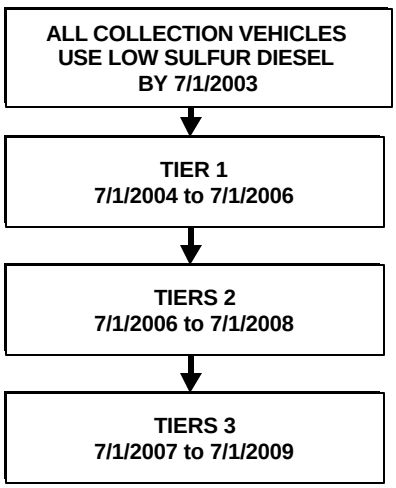
Retrofit - Collection Vehicles

- 67% Surveyed in California
- 65% Cummins Engines
- 13% M-11/ISM have Verified ECS
- No DDC Engines in Survey Meet Criteria
- More Verified ECS to Come

Proposed Rule Draft - Repower

- Repower Engine to a Certified 0.01 g/bhp-hr PM Emission Standard
  - Definition
    - Rebuilt, replaced, remanufactured
    - California certified kit or engine
    - Meets required certified PM emission level
  - Diesel engine certified to 0.01 g/bhp-hr PM emission standard
  - Diesel engine certified to 0.1 g/bhp-hr + ECS
  - Converted to alternative fueled engine

Proposed Rule Draft - Deadlines



Proposed Rule Draft - Deadlines

Tier	Engine Model Year	Fleet %	Implementation Date
1	1991-2002	25% 50% 100%	2004 2005 2006
2	Pre-1991	25% 50% 100%	2006 2007 2008
3	2003-2006	25% 50% 100%	2007 2008 2009

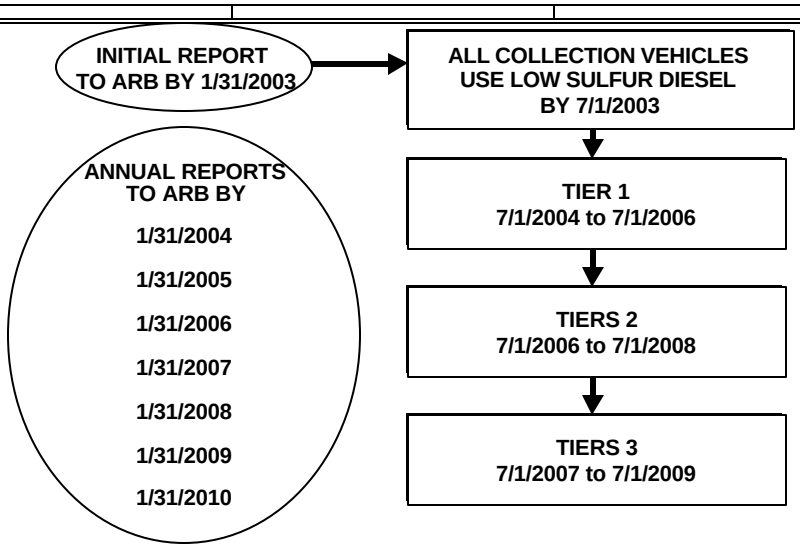
Proposed Rule Draft - Fuel

- Low Sulfur Diesel Fuel Used in all Diesel-fueled Collection Vehicles by July 1, 2003
- Application for Delay
  - Fuel/fuel infrastructure availability
    - Apply for delay to 7/1/2006
    - Documentation due to ARB by 1/31/2003
  - If fuel exemption granted, owner's Tier 1 vehicles moved to Tier 2 implementation schedule

Proposed Rule Draft - ECS

- Compliance Extension
  - No ECS available by six months prior to the vehicle model year's implementation date
    - Apply for one-year delay with annual report
  - Verifications announced by January 1st of each calendar year → Automatic delays
  - After the one-year delay, engine must use another method to meet the standard

Proposed Rule Draft - Reporting



Proposed Rule Draft - Reporting

- Reporting Made Easier
  - Initial report
    - Contact information
    - Vehicle/engine inventory
    - Retrofit information
  - Annual report
    - Changes to initial report
  - Maintenance and inspection records

Capital Costs

- Lowest Cost System:
  - ECS
    - Average $2540 (range $630-$5500)
  - Installation
    - Similar to muffler
    - Average $290 (range $160-$480)
  - Engine backpressure monitor (~$1000)
  - Costs not accounted for:
    - Training - included with cost of ECS

Operation & Maintenance Costs

- Low Sulfur Diesel Fuel
  - ~$0.06/gal extra
- Incremental Fuel Transportation
  - Average $230 (range $70 - $400) annually
  - Depends on distance, load, and frequency
  - Cost from 2003 - 2005
- Increased Maintenance/ECS Cleaning
  - Visual inspection
  - One cleaning per year
  - Average cost $80

Negligible Ash Disposal Fee

- Ash disposal from ECS cleaning
  - 10 - 15 grams per disposal
  - Once per year
- Manage with Other Hazardous Wastes

Cost Per Vehicle

Cost	Average Annual Cost per Vehicle*
Annualized Capital	$225
O & M	$80 ($510**)
TOTAL:	**$315 ($735**)**

*Based on four year lifetime.
**Cost includes incremental fuel and fuel transportation costs before July 1, 2006.

Additional Data Collection

- Demonstration Programs
  - LA City Sanitation - 15 collection vehicles
  - Older vehicle demonstrations
    - September 2001 – September 2002
  - In-depth engine survey for pre-1991 model year engines

Regulation Plans

- Workshops
  - Public comment by September 7, 2001
- Staff Report and Proposed Rule
  - October 26, 2001
- Board Hearing:
  - December 13 – 14, 2001

www.arb.ca.gov/diesel/dieselrrp.htm

Comments Encouraged

- Dual Fuel
- Costs
- Revised Implementation Schedule
- Revised Standards

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